ACUTE BENIGN PERICARDITIS OF UNKNOWN ORIGIN

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Since the earliest description of " idiopathic pericarditis " by Hodges in 1854 (Carmichael *et al.*, 1951) occasional records of small series or single cases of a benign form of pericarditis have been reported. Comer (1927) reported a case of pericarditis that he thought to be a sequel of acute sinusitis. Bing (1933) described six examples of a mild form of pericarditis, sometimes associated with pleurisy, clearly distinguishable from rheumatic and tuberculous pericarditis; he believed the disease to be infectious and suggested the title " epidemic pericarditis." The condition attracted little notice until Barnes and Burchell (1942) described its features in more precise detail and established it as a clinical entity. Since then it has been more widely recognized, especially in the United States. Nay and Boyer (1946) found 15 examples of " idiopathic pericarditis " among 46 cases of pericarditis of varied ætiology admitted to an Army Rheumatic Centre. Logue and Wendkos (1948) were of the opinion that the condition was often overlooked and in reviewing 77 cases of pericarditis they found 17 examples of this benign form, 6 of which had been originally diagnosed as cardiac infarction. Feder *et al.* (1950) described 5 cases; they believed the diagnosis was usually missed entirely and that the symptoms, when mild, were usually mistaken for influenza or pleurisy, and when severe, for coronary occlusion. Levy and Patterson (1950), after a study of 27 cases, thought the clinical picture was quite distinctive, the chief differential diagnosis being from cardiac infarction. Carmichael *et al.* (1951) in a full review of 50 cases, found that they had encountered the condition more frequently in recent years.

To date, little attention has been paid to the condition in this country. The following 5 cases illustrate many of the typical features of the condition and show some of the difficulties that may arise in differential diagnosis.

Case 1, a man, aged 34, was first seen in April, 1948. He gave a history that the previous night in bed he had developed a heavy ache behind the mid-sternum but managed to sleep. The pain was still present the next morning, gradually increased in severity and was aggravated by deep breathing.

On examination, temperature 99° F.; pulse regular; B.P. 125/80; the apex beat was not palpable; a loud pericardial rub was heard and there were many rales at both bases.

The pain lasted for two days; on the fifth day the pericardial rub disappeared and the temperature returned to normal. A cardiogram taken on the second day of the illness, was within normal limits, but on the fourth day there were RS–T changes characteristic of acute pericarditis. In a further record, two days later, the RS–T changes had disappeared but the T waves were diminished though positive. Three weeks later the tracing was within normal limits (Fig. 1). A chest X-ray, taken two weeks after the onset of pain, showed no abnormality. He made an uneventful recovery and was well when last seen three years later.

Case 2, a women, aged 18, was first seen in March, 1950. She gave a history that 4 weeks previously she had developed an unproductive cough and a week later woke up one morning with a continuous aching pain behind the mid-sternum. Pain persisted for the next two weeks, becoming severe when she walked, often compelling her to stop. After the first week it became stabbing in character and was aggravated by deep breathing. Malaise and breathlessness commenced as the pain disappeared and the day before her admission to hospital she experienced three severe and alarming attacks of dyspnœa.

On examination she was breathless and orthopnœic; temperature 100° F.; pulse regular and rate 130; the heart sounds were normal but distant; there were signs of pericardial effusion with cardiac tamponade, and a pleural rub was present at the left base behind.

Her dyspnœa and general condition improved following the removal of 50 ml. of blood-stained pericardial fluid, and three days later a pericardial rub was heard; this remained for 10 days. By the seventh day the patient was symptom-free but a low-grade pyrexia persisted till the eighteenth day. Chest X-rays, on admission, showed a moderately large pericardial effusion, which had almost completely re-absorbed by the end of three weeks. A small left-sided pleural effusion cleared rapidly. Serial cardiograms showed T wave changes typical of acute pericarditis and did not return to normal for about 4 months from the onset of chest pain. The pericardial fluid was sterile on culture and guinea-pig inoculations were negative for tubercle bacilli. The highest white cell count was 12,300, of which 76 per cent were neutrophiles. B.S.R., 30 mm. (Wintrobe) on admission, fell to normal in two weeks. Sputum contained many pus cells but no significant organisms. Mantoux reactions 1/10,000 and 1/1,000 were negative six months later. She was in good health when last seen ten months later.

Case 3, a man, aged 22, was first seen in September, 1950. He gave a history that two weeks previously he had developed a pain behind the mid-sternum, which he likened to indigestion. At first this pain was a constant ache but after a few days it became stabbing in character and was aggravated by deep-breathing. It remained thus for the following 10 days.

On examination, temperature 101° F.; pulse regular; B.P. 140/90; the apex beat was not palpable; the heart sounds were normal; a loud pericardial rub was present and also a pleural rub under the left scapula.

The pericardial rub disappeared on the seventh day and temperature settled on the eight day. He was symptom-free by the second week in hospital and made an uneventful recovery. On admission, teleradiograms showed enlargment of the heart shadow and this did not return to normal for six weeks. Serial cardiograms showed RS–T and T wave changes characteristic of acute pericarditis. The tracings remained abnormal for two months (Fig. 2). The white cell count was never greater than 9,000 (66% neutrophiles) and the B.S.R., which was slightly raised on admission, fell to normal in 3 weeks. Sputum contained pus cells but no organisms. Mantoux reactions 1/10,000 and 1/1,000 were negative 3 months after the onset of the illness. He was in good health when last seen 6 months after discharge from hospital.

Case 4, a man, aged 36, was first seen in February, 1951. He gave a history that three weeks previously he began to feel feverish and had developed a constant ache behind the mid-sternum which persisted for a week. The pain then moved to the left chest, became sharp and knife-like and was made worse by deep-breathing and certain movements such as bending towards one side.

On examination, the temperature was 100° F.; the pulse was regular; B.P. 120/80; the apex beat was not palpable; the heart sounds were normal; there was a faint pericardial rub and a pleural rub at the left base.

The pericardial rub had disappeared by the next day, the pleural rub persisted and a small effeusion developed at both bases; these quickly re-absorbed. Temperature rarely rose above 99° F. and settled in the third week. On admission, teleradiograms showed enlargement of the heart shadow with a little fluid in both pleural cavities. The appearances were normal at the end of a month. Serial cardiograms showed changes typical of acute pericarditis, the tracings remaining abnormal until seven weeks from the beginning of the illness. Pleural fluid contained 3·2 per cent protein and the cells were mainly lymphocytes; it was sterile on culture and negative on guinea-pig inoculation. The highest white cell count was 9,000 per cm. (74% neutrophiles); B.S.R., 51 mm. (Wintrobe) on admission, fell to normal in two weeks; cold agglutinins negative and complement fixation tests for influenza A. and B. and for Q. fever were negative, as also were agglutinations for *Streptococcus M.G.* Mantoux 1/10,000 was negative but 1/1,000 was weakly positive. His convalescence was uneventful.

Case 5, a girl, aged 5, was first seen in June, 1951. In February, 1951 she had been in an isolation hospital with measles complicated by pneumonia and followed by impetigo; recovery was complete and she returned to school. Three weeks before her admission in June she was noticed to be listless and a little breathless on exertion. There were no joint pains.

On examination, temperature 99° F.; pulse regular, rate 120; the apex beat was not palpable; there was a loud pericardial friction rub with normal heart sounds. There were no other abnormal findings. A provisional diagnosis of acute rheumatic carditis was made.

In spite of salicylates the temperature rose steadily to 103° F of by the seventh day. Thereafter it began to settle, and remained normal after the end of the second week. The pericardial rub disappeared two days later, the heart sounds remained normal and there were no murmurs. She was fretful for the first 10 days, after which her recovery was rapid and complete. Throughout the illness there were no joint pains or any other signs suggestive of acute rheumatism. Serial cardiograms showed the changes of acute pericarditis with a P–R interval of 0·14 sec. X-rays showed slight general enlargement of the heart shadow, which returned to normal in 4 weeks. The lung fields were clear throughout. The white cell count did not rise above 7,500 (57% neutrophiles, 35% lymphocytes). B.S.R. was 33 mm. (Wintrobe) on admission and

fell to normal after 9 days. Mantoux 1/10,000 was negative on two occasions. This case was exceptional in as much as the illness appeared to be painless throughout.

Little is known of the ætiology of this form of acute pericarditis and it is possible that it may not be the same in all cases. Numerous examinations of blood, pericardial and pleural fluids have failed to demonstrate an infective agent, except in two instances when a hæmolytic streptococcus was recovered from the pericardial fluid (Gardner, 1937; Rizler and Diebowts, 1948). A history of preceding infection, usually in the respiratory tract and often mild and transitory, was noted in about half the cases reported by Barnes and Burchell (1942) and by Carmichael *et al.* (1951) and there are clear accounts of pericardial effusions in young men following acute sinusitis (Comer, 1927) and acute pharyngitis (Willius, 1934). In this series Case 2 developed a dry cough one week before the onset of pericarditis and in both this case and in Case 3 pus cells were present in the sputum. Sometimes the condition appears to follow the common cold and this has led to the supposition that the causative agent may be virus, a view supported by the occasional occurrence of pericarditis in primary atypical pneumonia (Fuller and Quinlan, 1943; Finkelstein and Klainer, 1944).

The whole course of the illness is quite unlike that of acute rheumatism with active carditis and no case has been found to develop subsequent valvular heart disease (Nay and Boyer, 1946). A tuberculous ætiology is more difficult to exclude but evidence of active tuberculosis has always been lacking and the Mantoux reaction has been found negative in a number of cases (Carmichael *et al.*, 1951; Porter *et al.*, 1950 and Levy and Patterson, 1950). The Mantoux was negative in three of the four cases in which the test was done in the present series.

Clinical Features

A number of reports have stressed that the condition usually occurs in young adults; but according to Carmichael *et al.* (1951) this age incidence has been over-emphasized as 18 of their 50 cases were between 51 and 70 years and 14 were under 20 years of age. Pain is almost invariably the presenting symptom; it is usually likened to severe indigestion or a heavy ache. It is commonly felt behind the mid- or upper-sternum and may radiate into one or both shoulders. It lasts a variable time, usually a few days but sometimes persists for a week or more. At first the pain is generally constant but later may be aggravated by deep-breathing and movements of the trunk. Pleural pain may be present as well, sometimes from the onset but more often a few days later; it may be bilateral (Levy and Patterson, 1950) and may be followed by pleural effusion. Fever is usually slight and tends to settle in a week or so. Malaise is generally short-lived and once pain is relieved there is often a remarkably rapid return of well-being, at times in spite of the presence of fluid in the pericardium and both pleural cavities.

A pericardial rub is the important clinical finding. This usually appears early and, therefore, whether it is heard or not depends to a large extent on the stage of the illness when the patient first comes under observation. In published reports a pericardial rub has been recorded in about three-quarters of all cases and has remained present for roughly a week but in one instance persisted for as long as 60 days (Nay and Boyer, 1946; Levy and Patterson, 1950; Feder *et al.*,1950 and Carmichael *et al.*, 1951). If the rub is absent pericardial involvement may be overlooked, especially if a cardiogram is not available. Both pericardial and pleural effusions are common and the former may be blood-stained, as in Case 2 (Nathan and Dathe, 1946; Porter *et al.*, 1950). In the present series a pericardial rub was heard in every case, in four at the first examination and in one it appeared for the first time after paracentesis. In the five cases the rub remained for an average period of 7 days; the longest time was 14 days and the shortest was less than 12 hours.

Recovery is usually quite rapid and at the end of two or three weeks the electrocardiographic changes are often the sole remaining clinical abnormality. The average duration of the illness in one large series was 13 days (Carmichael *et al.*, 1951). Relapses are not uncommon and may occur a month or more after apparent recovery (Burchell, 1947; Levy and Patterson, 1950), in which case

pain, and the signs of pericarditis and pleurisy may all return and cardiographic changes may start afresh.

Laboratory investigations are of little help in the diagnosis, except in excluding positive evidence of active tuberculosis. There may or may not be a polymorphonuclear leucocytosis and the sedimentation rate, at first raised, falls to normal as a rule in the course of two weeks (Burchell, 1947).

X-rays reveal enlargement of the heart shadow in most cases. If the findings in a number of reports are considered together, then out of a sum total of 99 cases enlargement was present in 62 (Wolf, 1943; Nay and Boyer, 1946; Feder *et al.*, 1950; Levy and Patterson, 1950; Porter *et al.*, 1950, and Carmichael *et al.*, 1951). In many instances the presence of pericardial effusion has been proved by paracentesis (Barnes and Burchell, 1942; Levy and Patterson, 1950, and Porter *et al.*, 1950), and in one case the enlarged heart shadow was noted to return to normal after removal of 350 cc. of fluid. At first sight it would appear reasonable to presume that pericardial effusion is responsible for the X-ray changes in all cases, but this premise has been questioned by Wolf (1943), Burchell (1947), Levy and Patterson (1950), and Carmichael *et al.* (1951). These observers believe that cardiac dilatation plays an important part and may be solely responsible for the enlargement in some instances. They point out that considerable enlargement can occur within 12 hours of the onset of pain and that in spite of this rapid increase in size clinical evidence of cardiac compression is uncommon; moreover, the heart sounds may not be diminished and the voltage may remain normal in the electrocardiogram. The evidence in favour of cardiac dilatation is at the moment inconclusive and awaits further investigation. In the present series X-rays demonstrated enlargement of the heart shadow in 4 of the 5 cases. In one the enlargement was considerable and a pericardial effusion was proved by paracentesis. Enlargement was only slight to moderate in the remainder. Final examination showed the heart size within normal limits in each case.

Serial electrocardiograms reveal the typical pattern of acute pericarditis in a large majority of cases. These changes have been shown by Fowler and others (1932) and by Vander Veer and Norris (1939) to be the result of injury to the subepicardial muscle fibres and they characteristically occur in two phases. The first consists of elevation of the RS–T segments, most typically in all three standard leads but often in leads I and II, less often in II and III and occasionally only in either lead I or III. These changes are sometimes transient but usually last a day or so. At this stage the T waves remain upright and are sometimes sharply peaked, the RS–T segments being concave upwards (Barnes and Burchell, 1942). There is rarely reciprocal deviation of the RS–T segments in leads I and III and never QRS changes, such as occur in myocardial infarction, but the QRS voltage may be lowered if a pericardial effusion develops. In the second phase the RS–T segments return to the iso-electric level and the T waves become flattened and usually inverted. Serial cardiograms often show these T wave changes to be unstable, sometimes varying from day to day, and if frequent records are taken it is usual to find negative T waves in all three standard leads at some stage. Occasionally the RS–T elevation is not followed by T wave inversion (Coffen and Scarf, 1946), as shown in the cardiogram in Case 1 (Fig. 1). Chest leads follow the same pattern as the limb leads. Providing there are no permanent sequelae the cardiogram returns to normal usually in the course of six to eight weeks but may remain abnormal for two to three months. The improvement in the cardiogram does not necessarily run parallel with resolution of the pericarditis, the former may become normal even though the latter continues and an increasing amount of fluid is being formed (Vander Veer and Norris, 1939).

In tuberculous pericarditis RS–T changes are rarely seen (Bellet and McMillan, 1938; Vander Veer and Wagner, 1946), and in rheumatic pericarditis Wood (1950) were able to record either RS–T or T wave changes in less than half the cases. This is in sharp contrast to the findings in nonspecific pericarditis. Levy and Patterson (1950) found RS–T elevation in 19 of their 26 cases, in fact in every tracing taken in the first few days of the illness; in 6 cases the changes were limited to the T waves and only one case had a normal cardiogram throughout. The abnormalities remained for an average period of six weeks, the longest for three months. Likewise, of the 17 cases described by Logue and Wendkos (1948) RS–T changes were recorded in 15 and T changes in the

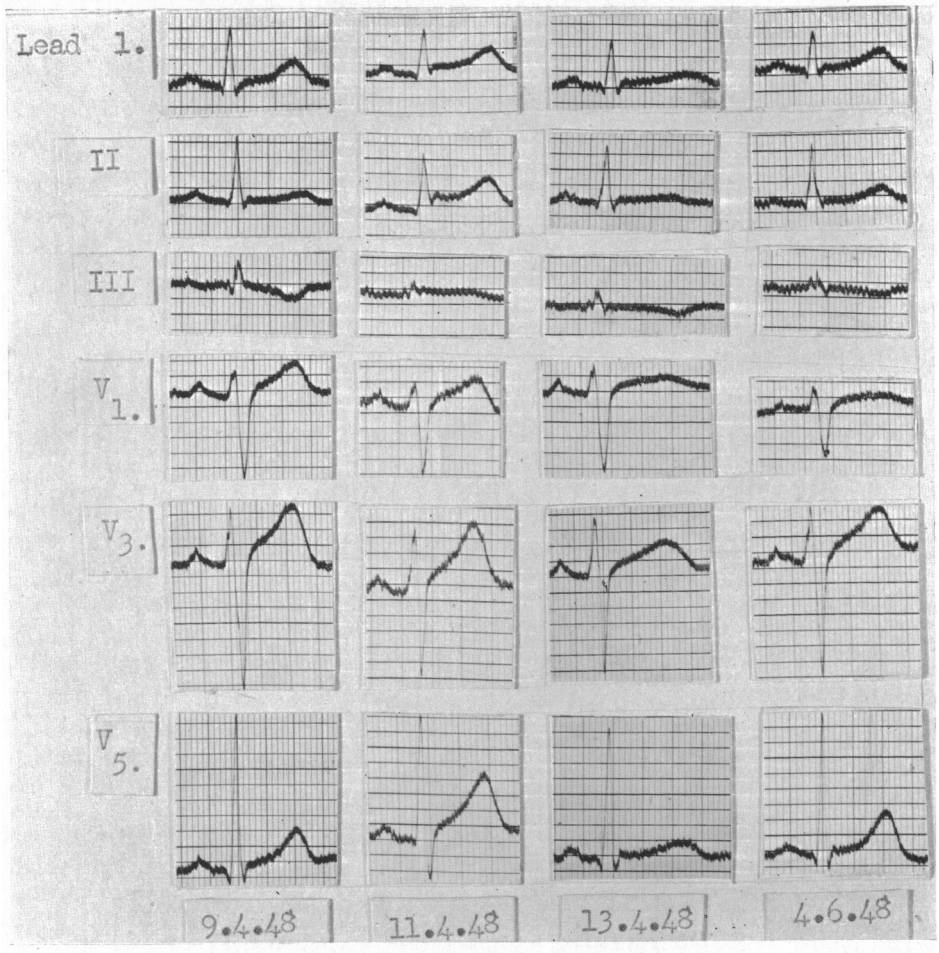

FIG. 1.—Cardiogram in Case 1, showing RS–T elevation in leads I, II and V5. The T waves later became flattened but T wave inversion was not recorded.

remainder. Feder and others (1950) found the cardiogram typical of pericarditis in all their five cases. It should be stressed that the P–R interval was not found prolonged in any of these reports.

In the present series cardiograms were characteristic of acute pericarditis in every case. RS–T elevation was recorded in two (Case 1 and 5) and in another (Case 3), investigated two weeks after the onset of pain, slight RS–T elevation persisted in the presence of T wave inversion (Fig. 2). According to Nay (1949) this association is unusual; he found that in pericarditis as opposed to cardiac infarction, the T waves seldom became inverted until the RS–T segments had returned to the isoelectric level. In Cases 2 and 4 the abnormalities were limited to the T waves. The tracings finally returned to normal in each case after an average period of seven weeks, the limits being 4 and 11 weeks.

DIFFERENTIAL DIAGNOSIS

The main features of this benign form of pericarditis are pain, pericardial friction and often pleurisy. The correct interpretation of these is important because errors in diagnosis may lead to unnecessary invalidism and prolonged observation. Barnes and Burchell (1942) drew attention to the fact that the condition was frequently mistaken for cardiac infarction. In nonspecific pericarditis

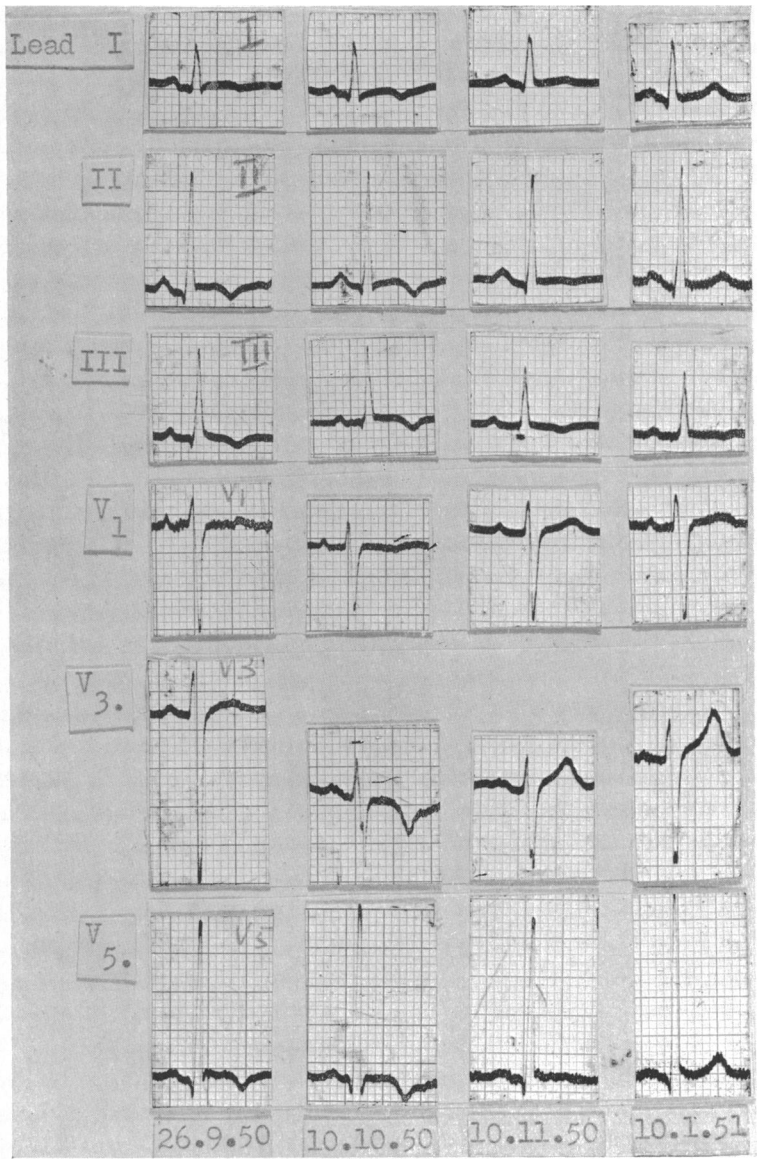

FIG. 2.—Electrocardiograms in Case 3. Inversion of the T waves has occurred before the RS–T segments have returned to normal.

the pain at its onset may closely simulate that of myocardial infarction both in its distribution and character. In the present series all patients were carefully questioned about the character of their pain; Case 5, a girl, aged 5, said she had no pain throughout the illness; in Case 1 the pain remained unchanged throughout except in as much as it was aggravated by deep-breathing on the last day; the three remaining patients all agreed that at first the pain was a constant severe ache felt behind the mid-sternum and quite unrelated to respiration; in the course of days the pain changed in character and became sharp and stabbing and was made much worse by deep-breathing and lying in certain postures, it was completely relieved by holding the breath. It lasted for an average period of 16

days, the limits being 2 days and 4 weeks. Thus it is at the beginning of the illness that the pain may be mistaken for that of cardiac infarction; but if the patient is examined at this stage, the finding of both fever and a pericardial rub so early should make one suspicious.

In nonspecific pericarditis, as opposed to cardiac infarction, shock is rare, often in spite of prolonged pain. This distinction is not infallible (Burchell, 1947), as was witnessed in the case of a 48-year-old man, at present in hospital under observation and not included in this present series: pain was accompanied by severe circulatory collapse, the clinical picture closely simulating that of a severe cardiovascular injury.

An isolated cardiogram may be confused with that due to cardiac ischæmia but serial records are nearly always decisive, as nearly every case shows the progressive changes of acute pericarditis (Nay and Boyer, 1946; Levy and Patterson, 1950, and Feder *et al.*, 1950). In fact, in Case 1, the diagnosis was at first thought to be cardiac infarction and a cardiogram, taken 36 hours after the onset of pain, was quite normal but serial records from the fourth day onwards were characteristic of acute pericarditis.

Acute non-specific pericarditis differs from tuberculous pericarditis both in its onset and subsequent course. The onset of the former is usually sudden and the chief complaints are pain and malaise, both of which may subside, often with unexpected suddeness, in the course of a week or so. This almost abrupt disappearance of distressing symptoms, with the restoration of a feeling of well-being, occurred in four of the cases here described. On the other hand, in tuberculous pericarditis pain is rarely a prominent feature; the onset is usually insidious and dyspnœa and cough are the common presenting symptoms (Clarke, 1929; Porter, 1945). The pericardial fluid may be blood-stained in both conditions and the cellular reaction mainly mononuclear in both pericardial and pleural fluids. If serial cardiograms are taken early in the course of the disease RS–T changes are usually found in non-specific pericarditis but rarely when the infection is tuberculous (Vander Veer and Wagner, 1946). The Mantoux reaction is helpful if persistently negative. Case 2 was too distressed on admission to hospital to give an account of her illness. She presented with a large blood-stained pericardial effusion, thought at first to be tuberculous. This, however, seemed unlikely when a full history was available, and was finally excluded by the course of the illness.

Acute rheumatic carditis has to be excluded, particularly in young subjects who have a history of recent upper respiratory infection and develop signs of pericarditis with X-ray evidence of cardiac enlargement. However, in non-specific pericarditis joint pains, signs of valvular damage, or disturbances in auriculo-ventricular conduction do not occur. Moreover, salicylates do not influence the temperature or the symptoms of the disease in any way. Case 5 was initially diagnosed as having acute rheumatic carditis but this had to be revised in view of the failure of salicylates to affect the rising temperature, the absence of joint pains, the progressive S–T and T changes with normal auriculo-ventricular conduction and finally the rapid and full recovery without any heart murmurs.

If, when the patient is first seen, signs or pericarditis have disappeared but a lymphocytic pleural effusion is present, this last finding may be sufficiently misleading to suggest a diagnosis of primary tuberculous pleurisy. In these circumstances pericardial involvement may be overlooked entirely without the help of X-rays or cardiograms. When Case 4 was admitted to hospital the only abnormal findings were a pleural rub under the left scapula and signs of fluid at the left base. A pericardial rub heard the previous day had disappeared by the same evening. It is possible that more examples of non-specific pericarditis would be found if all cases of transient pleural effusion of obscure ætiology were investigated by means of serial cardiograms.

Lastly, there is the problem of the patient seen four or six weeks after an illness characterized by severe retrosternal pain, revealing no abnormalities on physical examination but with T wave inversion in the electrocardiogram. In benign pericarditis T wave inversion may persist for two or three months (Feder *et al.*, 1950), but there are no QRS changes of cardiac infarction, and with full awareness of the cardiographic pattern of acute pericarditis the problem should present no great difficulty.

Prognosis and Treatment

The prognosis in acute nonspecific pericarditis is excellent and so far the only fatality that has been reported occurred in a patient mistakenly diagnosed as having an acute cardiac infarct and given anticoagulant therapy. This treatment may have been responsible for the hæmopericardium found at autopsy (McCord *et al.*, 1951). No case, as yet, has developed signs of constrictive pericarditis, but it is of interest that Carmichael and others (1951) found calcification in the pericardium of one patient four years after the initial illness.

The disease appears to be self-limiting, and symptomatic treatment is usually all that is needed. Taubenhaus and Brams (1950) tried the effect of aureomycin in three cases and claimed a dramatic response; but sudden improvement often takes place spontaneously in untreated cases, as, in fact happened in Case 4, at the time when aureomycin therapy was being considered. Penicillin, streptomycin, and sulphonamides have proved of no value (Levy and Patterson, 1950). Cardiac tamponade is rare but it occurred in Case 2, and has been previously described by Burchell (1947); both these patients needed pericardial aspiration, but this is exceptional.

Summary

Five examples of a benign form of acute pericarditis are described.

The onset of the condition is usually sudden and pain is the predominant symptom; this may simulate that of cardiac infarction. Fever and a pericardial rub are important early signs. Pleurisy is common and there may be effusions into both pericardial and pleural cavities. Recovery is usually complete in two or three months, but relapses may occur.

The condition has to be distinguished from rheumatic and tuberculous pericarditis, from primary pleurisy and from myocardial infarction.

The importance of serial cardiograms and X-ray findings are discussed.

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